Condor (continued from page 3)
taking up contaminants from other sources. There have been several documented cases of condor sickness, and one death, from birds feeding on poisoned rodents and other mammals.

Regardless of the source, Wilbur does not believe the contamination problem can be identified and corrected in time to help the condors.

In response to suggestions that condors should be captured to take tissue samples for pesticide analysis and for marking and release to study their range habits prior to capturing for propagation, Wilbur says such programs could be carried out at the same time birds are trapped for the breeding program. He says time is too limited, and the chances of uncovering pertinent new information too slim, to justify such a separate project.

In sum, Wilbur says there are enough condors now for six or seven breeding pairs, yet only at most two young are being produced each year. To replace birds dying from old age or accident, an estimated four or five young are needed annually just to maintain a total population of fifty birds.

Sexing Barrier

The team recommends that, if captive breeding is approved, trapping should begin in the fall of 1978. This would allow time for resolving problems associated with the methods to be used and obtaining the necessary permits.

One of the main barriers is the lack of a reliable sexing technique. Unlike the Andean condor, the California condor is not sexually dimorphic, and a chemical test is needed to differentiate male from female. A steroid sexing procedure developed by the San Diego Zoo, using chemical analysis of droppings, determined that Topatopa was a female. But the procedure subsequently has been found to be reliable only during the breeding season, and it is not known if it can be used to sex immature condors.

Dr. Ellen Rasch of Marquette University is developing a method for determining sex by measuring the weight of DNA in blood cells (female sex chromosomes are lighter) that already has worked well with cranes. Her system requires the drawing of only a single drop of blood for a smear on a slide, and the analysis can be completed in a few hours. She will be applying the test this summer to the Andean condors at the Patuxent center in an experiment to see if the technique is applicable to California condors.

Another problem to be solved is the absence of an absolutely safe method of capturing condors. Condors are hardy birds, and prior experience with capturing Andean condors and turkey vultures has shown they can be taken with minimal risk of injury. However, the total safety factor is required because a large number of birds may have to be captured to obtain enough for breeding.

A decision still has to be made on whether immature birds or adults would make the best breeding stock.

The Patuxent center has had breeding success with all of its Andean condor stock, including birds captured at stages ranging from one year to adult. The taking of young birds could be advisable if air pollution is a factor, because they would be less likely to have accumulated contaminants in their tissues.

Location of Breeding Pens

Another undecided question is the location of breeding facilities. California Fish and Game Department officials, who have tentatively endorsed captive propagation as a last resort, believe the breeding should be done in California—both because of public sentiment to keep the birds close to home and to avoid the need to acclimate the birds to be released.

Ray Erickson has suggested that some of the breeding stock be moved to the Patuxent center, where operational production of Andean condors has been achieved in a thoroughly tested (11 years) facility, with experienced personnel, and where full productivity of the birds now shows no evidence of environmental contamination. He believes that a measure of insurance would be provided by locating at least one California condor breeding unit outside areas where dangerous pollution has already been found to be a serious problem.

Erickson also suggests that plans to make releases to the wild should not overlook the possibility that some of the condor's former range, which extended through northern California, Oregon, and Washington to Puget Sound, may be more free of environmental problems and give better promise of successful reestablishment than southern California, where the condor is declining. Studies to determine the suitability of the northern Sierra Nevada, Cascades, and the Coast Range in the three Pacific Coast States should be an integral part of the research preceding actual releases of California condors produced in captivity, he said. Meanwhile, release experimentation in South America with Andean condors now being produced at the Patuxent center will provide guidance concerning the methods of release most likely to succeed with the California condor.

Artificial Nest Sites

The team's proposal to build two or three artificial nest sites—to be located in the Tehachapi Mountains, one of the condor's main feeding areas—is intended to enhance propagation in the wild. The nest sites would be constructed of fiberglass or other materials to simulate sandstone cliffs and would be located much nearer to reliable food sources than present nesting sites. It is the recovery team's belief that the absence of condor activity around suitable existing nest sites may be part of the reason for decreased nesting.

If artificial cliffs are erected, the team feels they may be used by condors. But there is no evidence that condors have in the past pioneered new nesting habitats. Thus this proposal is considered much less significant, although admittedly also less risky, than captive breeding.

The value of artificial nest structures, however, may become evident when captive-bred condors born in these structures in captivity recognize and use them when they encounter them in the wild.

All of the issues are under careful review by the Fish and Wildlife Service. The Service plans to develop a course of action in the next few months that will help encourage, insofar as is feasible with available resources, the continued survival of the condor.

Key Meeting on Wildlife Survival Set for June

The 2nd Symposium on Endangered North American Wildlife and Habitat is scheduled to be held in St. Louis, Mo., on June 1-5, 1977.

Entitled "Wildlife Survival: Orientation for Action," the June meeting is to be devoted to exploring what can be done about a worsening situation. The symposium, to be sponsored by Mutual of Omaha, will be hosted by the Wild Canid Survival and Research Center.

Among the more than 60 guest speakers and panelists will be keynote speaker Stewart Udall, former Secretary of the Interior; Marlin Perkins, zoologist, television personality, and acting director of WCSRC; and Keith M. Schreiner, associate director of the U.S. Fish and Wildlife Service and manager of the Service's Endangered Species Program. Schreiner will speak on recovery teams and plans and their role in Endangered species conservation.

For further information on the symposium, write to WCSRC, Box 16204, St. Louis, Missouri 63105.

Correction

The title of a new Alabama Museum of Natural History publication was incomplete as printed in the December-January issue of the BULLETIN. The full title is *Endangered and Threatened Plants and Animals of Alabama.* The publication is available for $5 from the Alabama Museum of Natural History, P.O. Box 5897, University, Alabama 35486.

Condor (continued from page 2)

California at Berkeley, a member of the Forest Service Condor Advisory Committee, has reservations as to the ability of condors to breed better in captivity than in the wild. He notes:

- If wild condors are so touchy about disturbance near the nest, "it seems unlikely that they would be less so in a pen."
- Wild birds carrying a burden of DDT or other pesticide "would not lose it in captivity."
- "Random pairing of birds in pens might or might not lead to romance. I would suppose the chances of a compatible pair meeting would be greater in a free population."
- It is possible many of the condors are beyond the age of reproduction. "They won't get any younger in pens."

Observations in the field indicate that wild condors achieve adult plumage at five or six years of age. Whether they will reproduce at that age in captivity has recently come under question through observations of Topatopa at the Los Angeles Zoo. This bird is now 11 years old, but only last year began exhibiting courting behavior. The bird's development may have been slowed by many years of captivity, where exercise, diet, or lack of contact with other condors may have hindered development.

3. Is captive breeding already too late?: The recovery team estimates it would be "at least five to ten years" before California condors bred in captivity would be available for release back to the wild. The observations of Topatopa indicate that it could be as long as 20-to-30 years, if the first generation of birds is kept as breeding stock and only the second and later generations are released to the wild.

The length of time required to produce concrete results is one of the principal arguments for early implementation of the proposal. As the natural population continues to decline, the odds will steadily shift against any plan of action. However, if 10-to-20 years must pass before any release can start, there is the chance that the wild population will already have dropped below the critical point.

Some biologists also fear that over this period much of the present condor habitat may be lost to human encroachment and development of mineral resources. Moreover, it is possible that the condor is declining because of environmental conditions that cannot be reversed. Hence, even if captive breeding succeeds, the birds released to the wild may be doomed because of environmental deterioration.

The recovery team recognizes the possibility of continued habitat degradation, and it emphasizes that the full range of habitat protection called for in the recovery plan must accompany captive breeding. Other conservation groups have expressed similar sentiments. Toby Cooper of the Defenders of Wildlife has noted that his organization could support the captive breeding plan only if there is "no erosion of the strength of the commitment to protect natural habitat."

4. Is the project economically sound?: The team has not yet estimated the costs of a captive breeding program. But the building and maintenance of facilities and the care of birds over several decades could total several million dollars. A Service review committee, which visited the team and the condor's habitat in March, has raised the question of whether it would be more prudent to invest this sum of money in the preservation of other species that may have a better chance of survival.

Dwindling Options

The review committee explored with team leader Wilbur the advisability of pursuing more research—as advocated by Koford—before deciding to proceed with captive breeding. Wilbur said there is little chance that an additional year of study would change the prognosis on the condor's fate or produce data to refute the need for captive breeding.

He pointed out that most of the recovery plan elements already carried out have had little noticeable beneficial effect.

Nesting and roosting sites have been closed to human activities of all types, and disturbance does not now appear to be a significant problem. The team, however, is concerned about additional oil drilling and pumping near and in the Hopper Mountain National Wildlife Refuge, acquired as a condor refuge and supplemental feeding area. The Government has not yet acquired mineral rights on the ranchlands.

Condors have not been feeding as much on livestock and deer carcasses set out for them as in prior years. This low condor activity could be associated with increased oil drilling in the area, or it may be due to a change in the condor's range. Condors may fly 50 miles in search of carrion. After eating, they may perch awhile nearby and later return to their evening roost or nest—all in a period of about five hours.

The Pesticide Question

Wilbur said the effects of pesticides that have been used in the condor's range may have been severe enough to account for breeding reduction in the 1960's. Wilbur has found evidence of significant eggshell thinning in eggs dating back to this period; in addition, moderate-to-high levels of chlorinated hydrocarbons have been found in dead condors, including one bird that died after being shot last year.

The discovery of pesticide residues was something of a surprise, in that condors feed for the most part on livestock, which normally are not heavily contaminated. Wilbur speculates that the condor may have some unusual metabolic process that leads to increased pesticide concentration in its tissues, perhaps associated with its "boom or bust" feeding habits—gorging one day and fasting for the next two-to-four days. It is also possible condors are

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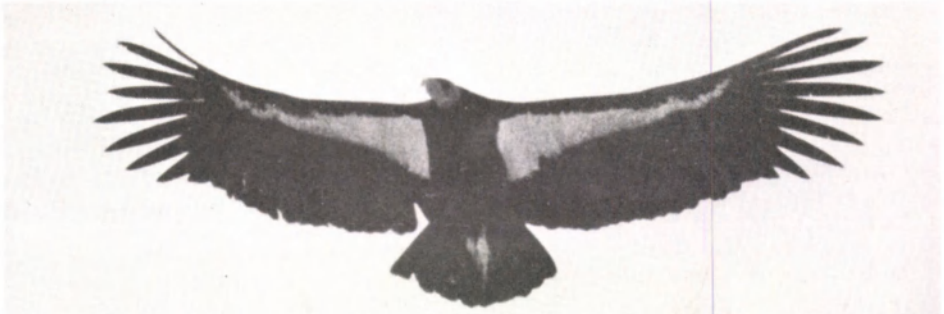

U.S. Fish and Wildlife Service Photo

California Condor (Gymnogyps Californianus)

The California condor (*Gymnogyps californianus*), a member of the family *Cathartidae* of New World carrion-eating vultures, ranks as the largest land bird in North America. The adult condor is almost 4 feet long, weighs about 20 pounds, and has a wingspread of about 9 feet.

The average lifespan of the condor is believed to be about 20 years, with individuals attaining the age of 40 or more. Sexes are nearly identical in appearance (consequently the male-female ratio of the remaining 40-50 birds is undetermined). In the wild, condors assume their adult plumage at approximately 6 years of age, and they begin breeding some time thereafter.

Paired birds court as early as October and lay eggs between February and May. They do not build nests. Rather, they simply lay their eggs on the sandy floor or in a crevice of a natural cave set in sandstone cliffs. A clutch consists of only one egg, and incubation takes between 42 and 60 days.

The young bird remains confined to the cave for about 5 months. After that, being still unable to fly any significant distance, it stays in the vicinity of the cave for an additional period of about 10 weeks. After fledging, the immature bird continues to depend upon its parents for several months.

Because of this lengthy young-rearing process, condors usually cannot breed every year. Nevertheless, breeding in consecutive years may occur at times when there is an abundant food supply and an absence of competition for food between the young birds and adult birds.

April 1977 Vol. II, No. 4

ENDANGERED SPECIES TECHNICAL BULLETIN

Department of the Interior • U.S. Fish and Wildlife Service • Endangered Species Program, Washington, D.C. 20240

The Gamble

Will Captive Breeding Save California Condor?

U.S. Fish and Wildlife Service Photo by Fred C. Sibley

Roosting condors at Sespe Condor Sanctuary (see map page 5).

In legends passed down from ancient times by the Chumash and other Indian tribes of the Far West, there is clear disagreement about the California condor. Some tales portray the carrion-eater with the huge wingspan as a symbol of good; in others, an appearance of the bird circling in the skies is a portent of bad times ahead.

Today, *Gymnogyps californianus* is at the center of another kind of "good" and "bad" conflict. Wildlife biologists generally agree that the largest land bird in North America is slipping slowly toward extinction. Less than fifty individuals remain, including one in captivity, and the California Condor Recovery Team estimates that the population is producing fewer than two young per year—not enough to maintain the present population level.

But there is disagreement over what could or should be done to preserve the condor. The focus of the controversy is a recommendation by the recovery team, in a "contingency plan" proposed last year, to initiate a captive breeding program in the fall of 1978.

Background of the Plan

The idea of a contingency plan—a last-ditch effort to save the condor by taking some individuals from the wild, breeding them in captivity, and eventually returning the progeny to the wild—was first brought up in the original condor recovery plan, approved in 1975. The plan itself, the prime objective of which was maintenance of a wild population of at least fifty individuals producing at least four young per year, did not

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Pending Rulemakings

With this issue of the BULLETIN, we are starting a new feature designed to provide our readers with advance notice of proposed and final rulemakings that are anticipated during the next 90 days. For the first such listings, turn to page 6.

Condor (continued from page 1)

advocate captive breeding. Rather, it specified detailed steps to maintain adequate nesting, roosting, and feeding conditions, to minimize annual mortality, and to increase public awareness of the bird's problems.

However, the plan noted the recommended steps may not suffice to save the condor "if numbers have fallen below that 'minimum population density' needed to sustain the species, or if some unidentified limiting factor continues to operate against it." Thus the plan also called for continued study of new methods to increase reproductive success and, if the situation becomes desperate, to implement a contingency plan to artificially increase productivity.

In mid-1976, after reviewing all evidence of the bird's continuing decline, the team decided to prepare its contingency plan.

This plan was not to be a substitute for implementation of the original recovery plan but rather a supplement to it. It called for action on two fronts: Establishment of a captive breeding program and construction of artificial nest structures in the Tehachapi Mountains to attract breeding condors to the abundant food supplies there.

The proposal has received both support and opposition. The World Wildlife Fund, the National Audubon Society, and the National Wildlife Committee of the Sierra Club have adopted resolutions endorsing the general principle of captive breeding as an essential step for condor survival.

On the other hand, prominent wildlife biologists A. Starker Leopold and Carl Koford have questioned the proposal, calling it premature and full of risks. Other groups have indicated they will support the plan if, and only if, its adoption does not lead to the weakening of efforts to protect the bird's natural habitat.

The recovery team itself has admitted that the proposal represents a gamble—but without it, the team argues, extinction of the species is inevitable.

Major Issues

Discussions of the team's proposal have centered on four major issues:

1. Is captive breeding too big a gamble at this time?: The team, headed by Sanford R. Wilbur of the Fish and Wildlife Service, maintains that captive propagation, plus installation of the artificial nest sites, "should insure that the condors are given the best chance of survival." Delay in implementing the plan, contends Wilbur, will only decrease its chances of success.

The main element of risk involves removal of seven condors from the wild over a two-year period to form four breeding pairs. One of them would be paired with Topatopa, the lone captive condor, a female at the Los Angeles Zoo. This would mean an approximately 15 percent reduction in the wild population; should captive breeding fail, this could speed up the process of extinction.

Ray C. Erickson, assistant director for endangered wildlife research at the Service's Patuxent Wildlife Research Center, believes "an absolute minimum" of nine condors should be captured to form a breeding pool of five pairs. This would permit greater geographical distribution of breeding facilities to help provide greater protection against regional air pollution. (Periodic analyses of Topatopa's feathers by Patuxent researchers have shown a steady increase in heavy metal concentration, apparently as a consequence of air pollution in the bird's environment.)

Strong opposition to captive breeding has come from Carl B. Koford of the University of California at Berkeley. Having done condor research in the 1940's and authored a comprehensive monograph on the bird for the National Audubon Society, he says: "Current biological knowledge of condors is inadequate to justify captures which will further endanger the wild population through reduction of numbers, and it is not certain that condors will breed better in cages than in the wild."

Koford rejects the team's claim that a rapid decision on captive breeding is critical to condor survival. Instead, he advocates "an impartial scientific review of evidence concerning the present status and welfare of the condor"; he feels that the Fish and Wildlife Service and the team have not made recent field data available to independent ornithologists to review. In addition, to pinpoint the causes of reproductive failure, he calls for two-to-three years of intensive field and laboratory studies of such factors as condor reproductive behavior, food and water availability (especially in light of the recent Western drought), pesticide and rodenticide burdens, and competition with golden eagles. From these studies, Koford maintains, less drastic means of saving the condor may be determined.

2. Will captive breeding succeed?: The recovery team believes that the successful breeding of Andean condors *(Vultur gryphus)* at the San Diego Zoo and the Patuxent Wildlife Research Center (see November 1976 issue of the BULLETIN), plus the fact that two female California condors produced a dozen eggs between them at the National Zoological Park in Washington, D.C., in the early 1900's, indicates the species will breed in captivity.

By taking eggs and young from the parents, production may be doubled or even tripled in captivity over what could reasonably be expected from their wild counterparts. In the wild, condors seem to lay a single egg no more frequently than every other year.

A. Starker Leopold of the University of

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U.S. Fish and Wildlife Service
Washington, D.C. 20240

Lynn A. Greenwalt,
Director
(202-343-4717)
Keith M. Schreiner,
Associate Director and Endangered Species Program Manager
(202-343-4646)
Harold J. O'Connor,
Endangered Species Category Coordinator
(202-343-4646)
John Spinks,
Chief, Office of Endangered Species
(202-343-5687)
Richard Parsons,
Chief, Federal Wildlife Permit Office
(202-634-1496)

TECHNICAL BULLETIN STAFF:
Marshall P. Jones, *Editor*
(202-343-7814)

Clare Senecal, *Assistant Editor*
(202-343-5687)

Regional Offices

Region 1, P.O. Box 3737, Portland OR 97208 (503-234-3361): R. Kahler Martinson, *Regional Director;* Edward B. Chamberlain, *Assistant Regional Director;* David B. Marshall, *Endangered Species Specialist.*

Region 2, P.O. Box 1306, Albuquerque, NM 87103 (505-766-2321): W. O. Nelson, *Regional Director;* Robert F. Stephen, *Assistant Regional Director;* Jack B. Woody, *Endangered Species Specialist.*

Region 3, Federal Bldg. Fort Snelling, Twin Cities, MN 55111 (612-725-3500); Jack Hemphill, *Regional Director;* Delbert H. Rasmussen, *Assistant Regional Director;* James M. Engel, *Endangered Species Specialist.*

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Region 5, One Gateway Center, Suite 700, Newton Corner, MA 02158 (617-965-5100); Howard Larsen, *Regional Director;* James Shaw, *Assistant Regional Director;* Paul Nickerson, *Endangered Species Specialist.*

Region 6, P.O. Box 25486, Denver Federal Center, Denver CO 80225 (303-234-2209); Harvey Willoughby, *Regional Director;* Charles E. Lane, *Assistant Regional Director;* John R. Davis, *Endangered Species Specialist.*

Alaska Area, 813 D Street, Anchorage, AK 99501 (907-265-4864): Gordon W. Watson, *Area Director;* Henry A. Hansen, *Endangered Species Specialist.*

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Counting Condors: Annual Survey Performed Since 1965

The current population estimate of between 40 and 50 California condors is based upon a survey made October 13–14, 1976.

Condor studies have been conducted annually in October since 1965 and have yielded a fairly consistent number of sightings.

One of the major survey difficulties is the vastness of the mountainous terrain used by the condors. An important variable is the weather. Condors tend to fly on warm days, leaving their nest sites and roosts after the sun has heated the air, and subsequently soaring on thermals.

In last fall's survey, 12 observation stations were manned by 36 watchers from noon until 5 p.m. on each day. Seven of the stations had been prebaited with goat or deer carcasses to attract as many condors as possible to the stations. The weather on both days was fair, with scattered clouds, light-to-moderate winds, and temperatures in the 70's and 80's, depending on the elevation of the stations.

Sightings Total 160

The first day produced 60 individual condor sightings by the watches. These were reduced by analysis to a probable actual total of 18 condors (14 adults, 3 subadults, and 1 unclassified as to age). Four of the birds were spotted at the Sespe Condor Sanctuary (see map), 2 adults in the Santa Barbara County mountains, and the remainder at the Tejon Ranch in Kern County.

About 100 sightings were made on the second day. This was reduced to a probable total of 22 different birds (17 adults and 5 subadults). Again most of the sightings were at the Tejon Ranch, which is a major feeding ground for the birds.

The largest single group seen either day consisted of 10 condors. The survey included only a few individual sightings, and there was good correlation between stations. Thus the estimated two-day total of 40 birds was considered by the California Condor Recovery Team to be "very close to the actual numbers of condors using the survey area."

Background

The survey was initiated in 1965 by the California Department of Fish and Game, which formed a California Condor Survey Committee composed of representatives of the State, U.S. Fish and Wildlife Service, National Audubon Society, U.S. Forest Service, and the California Division of Forestry.

The committee established a survey protocol that has been followed since then with some refinements. The first year, 70 observation stations were selected, including many fire lookout posts. Observers were given two training sessions each of four days duration.

Distribution of California Condors

California Department of Fish and Game Map

U-shaped range is believed to contain all remaining California condors, divided into two populations. The Sespe population nests year-long near Ojai and also ranges inland along the Sierra Mountains May-September. Coast range population based in Santa Barbara and San Luis Obispo Counties has an August-December seasonal range north to San Jose.

These sessions were to acquaint observers with the biology of the condor and its flight characteristics compared with those of the golden eagle, turkey vulture, and other raptors inhabiting the area. The observers also were taken into the field to enable them to become familiar with the local topography. Thereafter, the training of observers was undertaken prior to each survey.

Basic Technique

In performing the survey, observers use report forms on which are recorded the time condor sightings are made, direction in which the birds are flying, and other such pertinent comments as apparent age and plumage characteristics. These data are then reduced to eliminate duplicate sightings by two or more stations; this is done by triangulating flights path on a large map.

Service Clarifies Status of Wild Burro

To settle recent confusion about the legal status of the wild burro, a feral form of *Equus asinus* occurring in many Western States, the Service has issued a notice of clarification stating that the wild burro is not an Endangered species under the terms of the Endangered Species Act of 1973 (F.R. 3/24/77).

The confusion stemmed from the fact that, since 1970, the African wild ass *(Equus asinus)* has been listed as Endangered in its natural range of Ethiopia, Somalia, and the Sudan (F.R. 6/2/70).

The original listing of the African wild ass came under the Endangered Species Conservation Act of 1969, which provided for separate native and foreign lists. At that time, the species was included only on the foreign list. The subsequent Endangered Species Act of 1973 abolished the distinction between the two lists, and the first combined list published after passage of the new act (F.R. 9/26/75) failed to note that only the African populations of the species were listed.

When the list is next republished in the *Federal Register,* the entry for *Equus asinus* will clearly indicate that the listing applies only to the wild populations in Africa. This is considered to be purely correction of a clerical error, not a change in the status of the wild burro.

RULEMAKING ACTION MARCH 1977

Black Toad

The black toad (*Bufo exsul*) has been proposed for Threatened status and its range in Inyo County, Calif., has been proposed for listing as Critical Habitat (F.R. 3/11/77).

This species occurs only in Deep Springs Valley, where its habitat consists of small areas in the vicinity of Antelope Springs and Buckhorn Springs. Suitable habitat in these areas covers only 9,300 square meters (about 2.3 acres).

The chief threat to the black toad is represented by man's need for water. Periodic recanalizing of the stream channels at Buckhorn Springs to provide water for livestock and irrigation lowers the water table in the marshlands where the toads breed. This causes parts of the marshlands to dry out, which can have a severe effect on the toad population if it occurs after oviposition but before the tadpoles have metamorphosed into toads.

Overcollection is also a threat to the species. Noted for its attractive coloration, the black toad has long been a favorite with amphibian collectors. In the 1960's, for example, the toad population in the easternmost area around Buckhorn Springs declined as a result of overcollecting.

The Buckhorn Springs areas were closed to the public in 1971, but the Antelope Springs areas are still readily accessible.

The Service believes that Threatened status would further discourage collectors, in addition to the protection provided by the State of California, which already prohibits the taking, possession, or sale of black toads.

The areas proposed for Critical Habitat consist of a major area of marshlands in the vicinity of Buckhorn Springs and a relatively small area of marshlands at nearby Antelope Springs.

Comments are due by May 13, 1977.

BOX SCORE OF SPECIES LISTINGS

Category	Number of Endangered Species			Number of Threatened Species		
	U.S.	Foreign	Total	U.S.	Foreign	Total
Mammals	36	227	263	2	17	19
Birds	66	144	210	1		1
Reptiles	8	46	54	1		1
Amphibians	4	9	13	1		1
Fishes	30	10	40	4		4
Snails		1	1			
Clams	22	2	24			
Crustaceans						
Insects	6		6	2		2
Plants						
Total	172	439	611	11	17	28

Number of species currently proposed: 92 animals
1850 plants (approx.)
Number of Critical Habitats proposed: 39
Number of Critical Habitats listed: 6
Number of Recovery Teams appointed: 57
Number of Recovery Plans approved: 8
Number of Cooperative Agreements signed with States: 17

March 30, 1977

Pending Rulemakings

The Service expects to issue rulemakings on the subjects listed below during the next 90 days. Final decisions on these anticipated actions will depend upon completion of the analysis of comments received and/or new data made available, with the understanding that such analysis may result in modification of the content or timing of the original proposal, or the rendering of a negative decision.

The status or action being considered for the following is given in parentheses:

Final Rulemakings

- Plant regulations
- Captive self-sustaining populations regulations
- Bald eagle (modification of status in Lower 48 States)
- Marianas mallard (Endangered)
- Leopard darter (Threatened)
- Slackwater darter, Alabama cavefish, spotfin chub, slender chub, yellowfin madtom (Endangered)
- 26 snails (Endangered and Threatened)
- St. Croix ground lizard (Endangered)
- Giant anole (Endangered)
- San Clemente Island species (Endangered)
- 14 plants (Endangered and Threatened)
- Florida everglade kite (Critical Habitat)
- Peregrine falcon, California (Critical Habitat)
- Palila, Hawaii (Critical Habitat)
- Cape Sable sparrow, Florida (Critical Habitat)
- Dusky seaside sparrow, Florida (Critical Habitat)
- Morro Bay kangaroo rat, California (Critical Habitat)

Proposed Rulemakings

- Ozark big-eared bat (Endangered)
- Virginia big-eared bat (Endangered)
- African elephant (similarity of appearance to Asian elephant)
- Timber wolf (modification of status in Lower 48 States)

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